REMARKS

The Office Action mailed December 29, 2004 has been carefully considered. Reconsideration in view of the following remarks is respectfully requested.

Interview Record

Applicants gratefully acknowledge the courtesy and consideration extended to Applicants' undersigned representative during the telephone interview with Examiner Frank Duong on April 19, 2005.

During the interview, Applicants' undersigned representative forwarded via email a copy of a proposed amendment of Claims 1 and 33 to Examiner Duong, said amendment being identical to that presented in the instant Reply. The amendment was discussed in the interview, and the distinction between Doshi and the claimed invention was elaborated. In particular, consistent with the discussion below, it was pointed out to the Examiner that Doshi does not disclose overhead transparency; rather, the transparency discussion in Doshi pertains to payload transparency. The significance of this distinction was pointed out, and is discussed in detail below. While unwilling to make a commitment, the Examiner indicated that the proposed amendment appeared to overcome the prior art.

Rejection(s) Under 35 U.S.C. § 102

Claims 1 – 16, 26, 29 and 32 – 34 were rejected under 35 U.S.C. § 102(b) as anticipated by the IEEE article "IP Over SONNET," (first-named author is Manchester, in the Office Action and hereinafter referred to as Doshi).

According to the Office Action, a TDM function would be included in the WDM-TM in Fig. 6 of Doshi. Doshi states (for example, see lines 20 to 22, right-column, page 141, "With only TDM transport interfaces, ... OC-192)."), that this TDM is a SONET-TDM. For example, 4 x OC-3 comes out to OC-12, and 4 x OC-12 becomes OC-48 and so on. This SONET-TDM in a WDM-TM box functions to insert new overhead information, according to the SONET/SDH standard. However, in the system described in Doshi, the new overhead information in the high speed line (e.g., OC-48) is inserted after erasing low speed SONET/SDH overheads (e.g., OC-12). This situation is illustrated in FIG. A below.

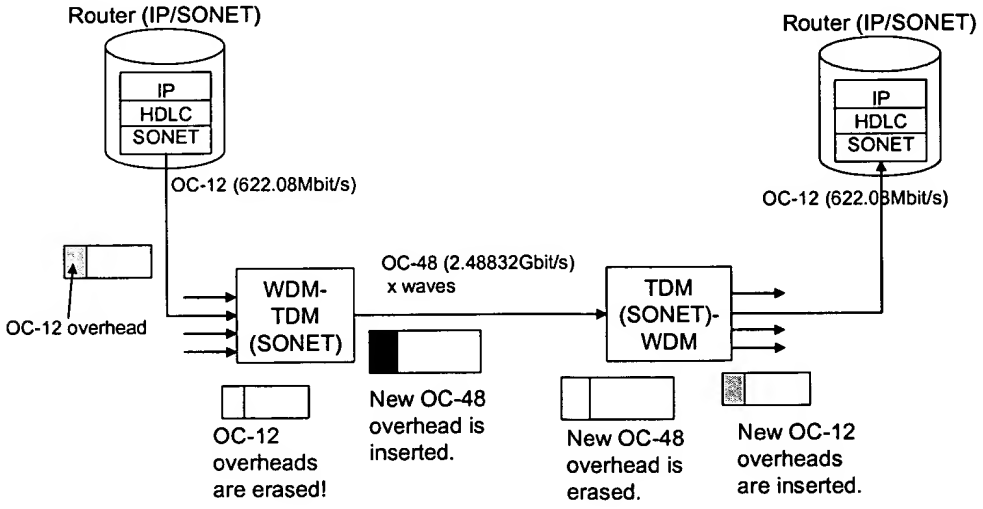

FIG. A TDM-WDM in SONET/SDH

The erasure of overhead is called "overhead termination." This function is clearly specified in ITU-T standard G.707, (sections 7.1.1 and 9.1.1). Accordingly, the new overhead information requires no additional bandwidth, because the erased overhead area is reused to insert new overhead information. The bit-rate of the high speed line is exactly 4 times that of the low speed line. When 4 OC-12 are multiplexed in the SONET/SDH TDM manner, the OC-48 bit-rate is 2.48832 Gbit/s which is exactly 4 times of that of OC-12 (622.08 Mbit/s).

In contrast, in accordance with the present invention, low speed OC-12 SONET/SDH overhead information[1] is not erased when TDM is executed, as is shown in FIG. B:[2, 3]

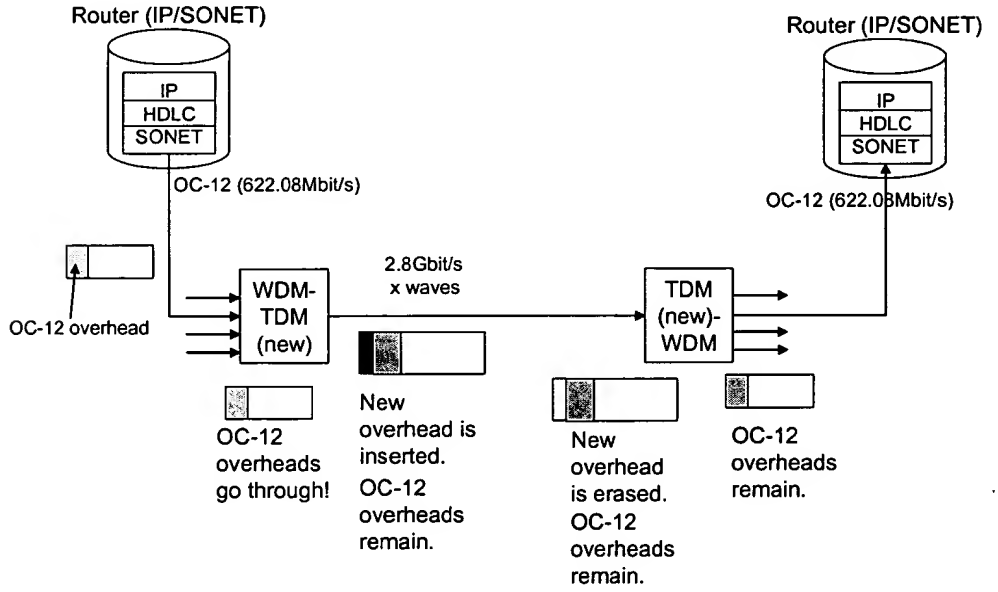

FIG. B TDM-WDM in the present invention

[1] This corresponds to "client overhead" recited in the independent claims.
[2] Support for this feature can be found, for example, in the phrase "time division multiplexing of a whole signal of a client including client overhead transparently" recited in Claim 1 and in the phrase "time division multiplexing transparently to whole signal of a client" recited in Claim 33.
[3] See also page 12, item (1), of the specification.

In accordance with the invention, bandwidth is added to a multiplexed signal in order to provide new overhead information,[4] for maintaining low speed overhead information embedded in the low speed signal.[5] The bit-rate is greater than 4 times that of the low speed signal. When multiplexing 4 OC-12 according to the invention, the resultant bit rate is higher than 2.48832 Gbit/s, for example 2.8 Gbit/s depending on the amount of new overhead information added.[6, 7]

An important characteristic of this invention is maintaining all overheads even if they are in lower layers (physical layer, data-link layer, etc). Doshi's paper declares "payload transparency",[8] but does not state "overhead transparency" especially for physical layer overhead, like SONET/SDH overhead.

A fundamental difference between SONET/SDH TDM and this invention's TDM is that the bit-rate resulting from multiplexing is different. SONET/SDH TDM produces exactly integer times of the low speed bit-rate. On the other hand, this invention's TDM produces a greater bit-rate than is produced by SONET/SDH TDM. The bit-rate difference is fundamental for electric circuit design, for instance in Clock Data Recovery (CDR), a payload mapping circuit, a clock conversion circuit, and so on.

The decision of whether or not to erase the low speed (physical layer) overhead produces some effects in network management. Consider the configurations shown in FIGS. A and B

[4] This corresponds to "additional overhead" recited in the independent claims.
[5] This corresponds to "whole signal of a client" recited in the independent claims.
[6] Support for this feature can be found, for example, in the phrase "attaching an additional overhead to said whole signal of said client" recited in Claim 1 and in the phrase "attaching an additional overhead to the whole signal" recited in Claim 33.
[7] See also page 12, item (2), and page 16, lines 12 to 14 ("And, because of ... is denoted by f3xn."), of the specification.

above, wherein 4 x OC-12 from routers are multiplexed and transmitted point-to-point by TDM-WDM equipment. Routers are assumed to be owned, controlled, and managed by an Internet Service Provider (ISP) and the TDM-WDM equipment is assumed to be owned and managed by a Carrier, who is a different service provider.

Case 1: Computer communication on Data Communication Channel (DCC) in SONET/SDH overhead:

Each router is assumed to be provided with SONET/SDH management function, because it transmits and receives OC-12 signal. It is often the case that an operator of an ISP wants to do a "remote login" into the router on the other site. SONET/SDH has overheads for this purpose, and these bytes are called DCC bytes (D1 to D12 in SONET/SDH designation). Here in the example shown in FIG. C below, in the case of SONET/SDH TDM like in Doshi's paper, computer communication is shut-out at site C in the carrier's office, because OC-12 overhead is erased by the TDM-WDM equipment. This ISP operator may have to prepare a separate line for that communication.

[8] Doshi, p. 138, left column, ll. 10 – 19.

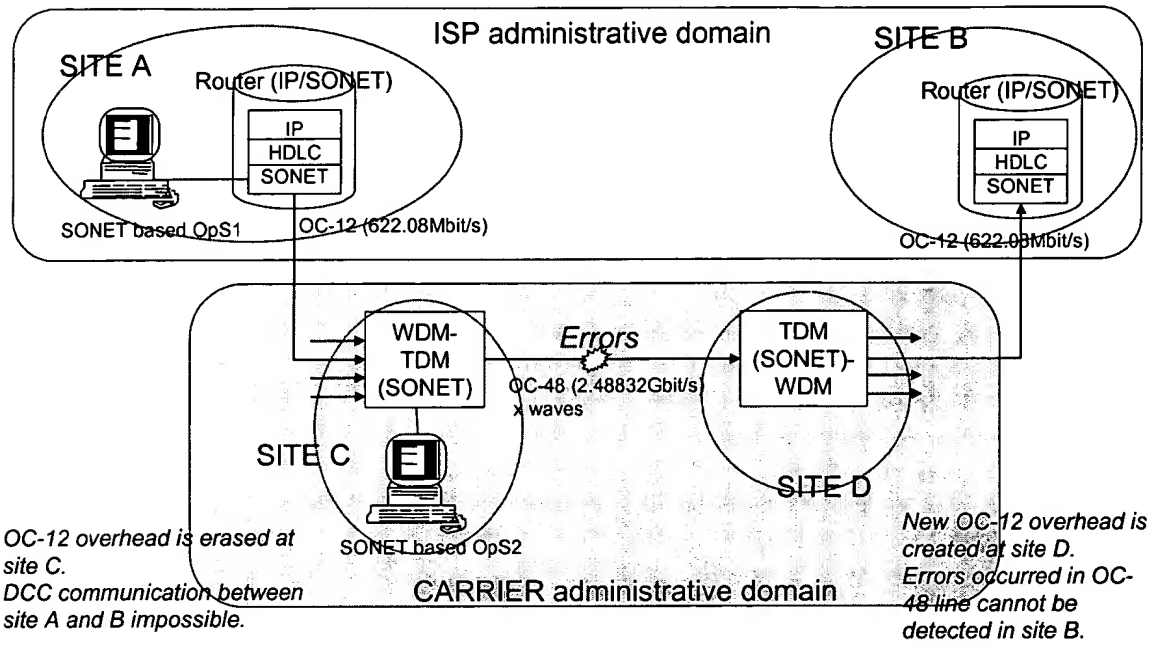

FIG. C Effects in the case of SONET/SDH TDM-WDM

In the case of this invention, no OC-12 overhead is terminated. Therefore, computer communication via DCC bytes is available directly from site A to site B in the ISP's office. The situation is illustrated in FIG. D:[9]

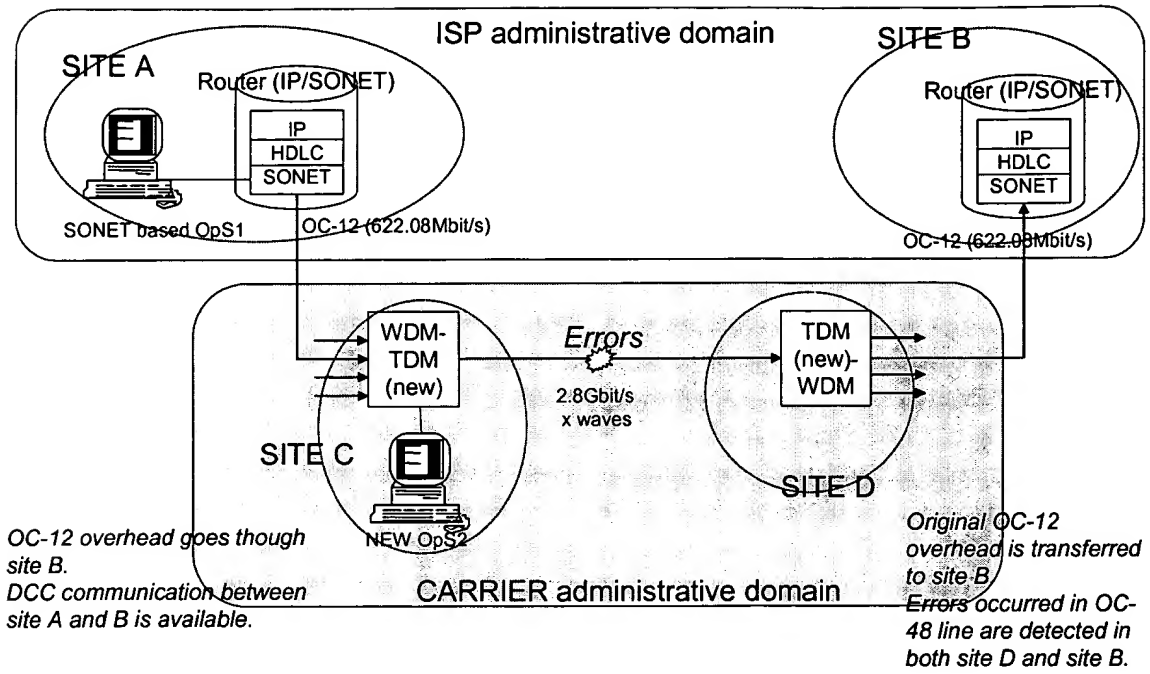

FIG. D Effects in the present invention TDM-WDM

Case 2: Bit error monitoring by the ISP operator using Bit Interleaved Parity (BIP) in SONET/SDH overhead

Bit errors occurring in the transmission line can be monitored by using BIP calculation using the SONET/SDH function. At the transmitter side, a calculated BIP value is written in B1 and B2 SONET/SDH overhead. At the receiver side, a BIP value is re-calculated and compared with transmitted B1 and B2 values. If the values are inconsistent, it is recognized that errors have occurred (clearly specified in ITU-T standard G.707 sections 9.2.2.4 and 9.2.2.10). Here, suppose that some errors occurred in the WDM line between two pieces of equipment of TDM-WDM and WDM-TDM.

[9] See also page 14, second paragraph ("With respect to (2), ... "), of the specification.

In the case of SONET/SDH TDM like in Doshi's paper as shown in FIG. C above, errors are detected by WDM-TDM equipment at site D using OC-48 overhead, hence the carrier can detect that errors have occurred. After demultiplexing, WDM-TDM equipment at site D transmits OC-12 to a receiving router at site B, where WDM-TDM equipment calculates a BIP value including errors and inserts the calculated BIP value in B1 and B2 overhead. Since the BIP is recalculated after errors occur, the BIP value and the transmitted B1 and B2 bytes are consistent in the router at site B. In that case, the ISP operator at site B cannot detect errors using SONET/SDH overhead, although errors are included in the user's information. Since users may be aware of the errors by noise, etc., contained in images, sounds, and so on, due to the errors included in the user's information, the ISP may receive complaints from the users, but the ISP may not be able to recognize the errors. Therefore, the ISP may complain to the carrier that errors are in the carrier's network, and the carrier may have to report their own network situation to the ISP.

In the case of TDM of the presently claimed invention, the B1 and B2 bytes are not rewritten at site C and site D. That enables error detection for the ISP operator in the router at site B using SONET/SDH overhead. Of course, additional overhead inserted by TDM-WDM equipment includes an independent error detection mechanism[10], so that the carrier can also detect errors independent of SONET/SDH overhead.[11] In this way, both the ISP and the carrier can detect errors, so that it is not necessary for the carrier to equip a mechanism for reporting the errors to the ISP. Therefore, the carrier and ISP can operate independently.

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[10] This feature can be seen in the phrase "wherein said additional overhead contains bits defining error correction" recited in the independent claims. Dependent Claim 5 elaborates this feature in the phrase "quality degradation of the signal or failure detection is performed by an error correction bit counter".

[11] See also page 12, item (4), and page 14, fifth paragraph, to page 15, second paragraph ("With respect to (4), ... without attracting attention of clients."), of the specification.

As described above, this invention is fundamentally different from the disclosure Doshi at least in the following ways:

1) This invention does not erase any overheads including physical layer overheads in low speed signals.
2) The bit-rate is increased compared with SONET/SDH TDM.
3) Computer communication is available directly via physical layer overheads of low speed signals.
4) Errors can be detected both by physical layer overheads of low speed signals and by new high speed overheads.

Doshi fails to disclose or suggest the claimed features of this invention—that is, "time division multiplexing means for applying time division ***multiplexing of a whole signal of a client including client overhead transparently***; attaching means for ***attaching an additional overhead to said whole signal of said client***" recited in Claim 1, "applying time division ***multiplexing transparently to whole signal of a client*** and ***attaching an additional overhead to the whole signal***" recited in Claim 33. Doshi therefore fails to realize the above-described effects resulting from these novel features.

Moreover, the limitations incorporated in the independent claims further define the contents of the additional overhead, and thus it is obvious that Doshi's paper also fails to disclose or suggest such limitations.

It will be appreciated that, according to the M.P.E.P., a claim is anticipated under 35 U.S.C. § 102 only if each and every claim element is found, either expressly or inherently described, in a single prior art reference.[12] The aforementioned reasons clearly indicate the contrary, and withdrawal of the 35 U.S.C. § 102 rejection based on Doshi is respectfully urged.

Request for Entry of Amendment

Entry of this Amendment will place the Application in better condition for allowance, or at the least, narrow any issues for an appeal. Accordingly, entry of this Amendment is appropriate and is respectfully requested.

Conclusion

In view of the preceding discussion, Applicants respectfully urge that the claims of the present application define patentable subject matter and should be passed to allowance.

If the Examiner believes that a telephone call would help advance prosecution of the present invention, the Examiner is kindly invited to call the undersigned attorney at the number below.

[12] Manual of Patent Examining Procedure (MPEP) § 2131. See also *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

Please charge any additional required fees, including those necessary to obtain extensions of time to render timely the filing of the instant Amendment and/or Reply to Office Action, or credit any overpayment not otherwise credited, to our deposit account no. 50-1698.

Respectfully submitted,
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Dated: 4/26/'05

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